Evaluation of the Price Models

Figures 14 and 15 show graphs of historical prices for corn and wheat over the model estimation period of 1975-96, along with the predicted values derived from estimated equations 7a and 7b. In general, the price models track actual prices well. Most differences between the model estimates and the actual prices are less than 15 cents per bushel for corn and less than 20 cents per bushel for wheat.

As can be seen in figures 14 and 15, the models capture turning points quite well. A turning-point error can be defined statistically, as in equations 8a and 8b, to occur when

$$(8a) \quad (\text{Predicted}_t - \text{Actual}_{t-1})(\text{Actual}_t - \text{Actual}_{t-1}) < 0$$

<div align="center">or</div>

$$(8b) \quad (\text{Predicted}_t - \text{Predicted}_{t-1})(\text{Actual}_t - \text{Actual}_{t-1}) < 0$$

"Predicted" and "Actual" are predicted prices from the models and actual prices, respectively, and subscripts "t" and "t-1" represent current and lagged time periods. Defined this way, the statistic measures whether predicted year-to-year changes from the models are directionally the same as changes in actual prices. Turning-point errors can occur in two ways: first, when actual prices indicate a turning point but predicted prices do not and,

second, when actual prices do not indicate a turning point but predicted prices show a turning point.

The different definitions for the occurrence of a turning point in equations 8a and 8b relate to whether the change in the predicted price is measured relative to the previous year's actual price (equation 8a) or the previous year's predicted price (equation 8b). Both measures are useful, but the appropriate definition to use depends on the intended use of the model. For short-term forecasting applications of the models where the previous year's actual price is known, the former measure is more appropriate. For longer term forecasts where the previous year's actual price is not known, the latter definition is better to use. Since these price models are intended for both short-term and longer-term forecasting, both definitions are used. Over the 1975-96 model estimation period, neither price model has any turning-point errors when lagged actual prices are used in the turning-point error definition (equation 8a), while each price model has only 1 turning-point error when lagged predicted prices are used (equation 8b).

Table 2 shows mean absolute errors and mean absolute percentage errors for the corn and wheat models for the full estimation period, 1975-96, and for a selected subsample of recent years covering 1991-96. For the full sample, the mean absolute error is about 9 cents per
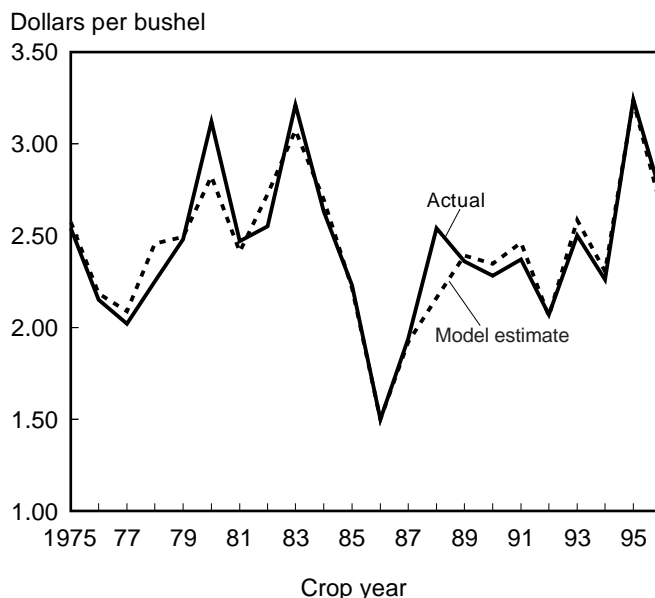
Figure 14
Corn prices—Actual and model estimate

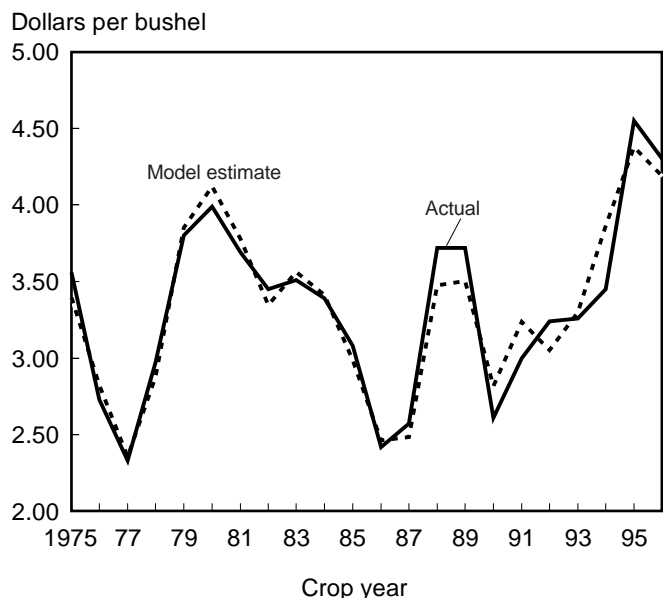Figure 15
Wheat prices—Actual and model estimate

Table 2—Corn and wheat model performance measures, selected periods

Time period	Mean absolute error		Mean absolute percentage error	
	Corn	Wheat	Corn	Wheat
	Cents per bushel		*Percent*	
1975-96	8.7	13.1	3.4	3.9
1991-96	5.1	19.4	2.1	5.5

The corn price equation includes a dummy variable for 1986, so has no error in that year. Omitting 1986 from the corn model performance calculations raises the 1975-96 mean absolute error to 9.1 cents per bushel and the 1975-96 mean absolute percentage error to 3.6 percent.

bushel for corn and 13 cents per bushel for wheat, with a mean absolute percentage error of about 3 percent for corn and 4 percent for wheat. Importantly, for price-forecasting applications, the corn price model performance has been good in recent within-sample years (1991-96), with a mean absolute error of about 5 cents per bushel and a corresponding mean absolute percentage error of about 2 percent. Model performance in those recent within-sample years for wheat has not been as good as for the full sample period, with a mean absolute error of about 19 cents per bushel and a mean

absolute percentage error near 6 percent. A potential contributing factor to these larger errors is that the 1991-96 period included years of significant wheat-export price subsidies by both the United States and the EU, which are not included in the wheat price model.

Overall, the statistical measures indicate good performance for the price models and suggest that the price models provide an analytical framework that can be useful in price-forecasting applications.